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KANT'S THEORY OF THE A PRIORI FORMS OF SENSE.

II.

HAVING seen in a previous article[1] that Kant's arguments for the *a priori* nature of time are untenable, we now ask, Does the case stand otherwise with space? There is at any rate this difference, that Kant's arguments originated with space, and were thence transferred to time. And it is quite conceivable that they have an original validity which is yet lacking in their derivative application to time. Furthermore, they may draw support from the fact of geometry, though, in truth, they were put forward to explain its possibility. However this may be, there is difference enough to justify a separate consideration of the question.

The analysis or "metaphysical exposition"[2] of the notion of space need not long detain us, as it is identical with that of time. First, comes the negative thesis that "space is not an empirical notion which has been derived from external experience." And the reason is that "external experience is itself possible only by means of the *Vorstellung* of space." There is here no word of a world beyond our actual perceptions.[3] The meaning is that the space we perceive cannot be derived from the objects we perceive, because it is already implied in them. They are a part of the problem, not its solution. Yet Hume fell into the absurdity of deriving space from a series of colored points. Space, Kant means, is not abstracted from experience as something new and different from it. It is a constituent of experience, itself as ultimate or more ultimate than any other. So far all is clear. But, in the second thesis, Kant claims that space is a necessary *Vorstellung a priori*, forming the foundation of all external perception. His ground is that we can think space without objects, but not objects without space. The general arguments against this contention have already been given under the parallel account of time. Space and time without objects and events would collapse. But yourself, including your own body, you cannot think out of space. And the space in which no other objects occur itself becomes an object which fills the field of vision and has a color, light or dark, inseparably connected with it. Nor is space a necessary *Vorstellung*. For in the field of vision, where we have the most decided, if not the only, direct perception of space, there is a blank behind our back. Were space a necessary perception *a priori*, or necessary form of perceiving (as Kant afterwards expresses it), how could we explain its restriction to the perceptions of sight and touch? For sounds, smells, and tastes are not spatially ordered except in some cases indirectly by means of association. Yet, if space be a necessary form of perception, this arbitrary preference for certain perceptions seems inexplicable.

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[1] The Philosophical Review, January, 1899.

[2] III, 58 ff. (20 ff., S. 140 ff).

[3] On that account, the first argument cannot, as Erdmann (*Kant's Reflexionen*, II, 108 note; see no. 347) supposes, be directed against what Kant calls "Leibniz's

The remaining thesis of the "metaphysical exposition" is to the effect that space is a perception. The proof, as in the case of time, is that space "is essentially one, any plurality of parts or units in it (consequently also the general notion of spaces) rests solely on limitations of itself." But it has been already shown

view, that the notion of space is derived from *things*." That view Kant meets by a very different argumentation, namely, that it would rob geometry of its apodictic certainty. It is also very doubtful if Kant had Hume's or the empiricist's argument n mind, as Cohen asserts (*Theorie der Erfahrung*, p. 7). Kant is simply analyzing the notion of space, and he finds that spatial objects and relations are not prior to it.

that a unitary idea or *Vorstellung* is not necessarily a perception, reality, for example, being a notion. And as to the assertion that the one space precedes all particular spaces as underlying ground of their determination, neither Kant's explanation nor the actual facts of experience can make it for a moment credible. Kant says this "space is represented or presented (*vorgestellt*) as an infinite given quantity." But quantity is an abstract notion; and if space is given as quantity, it must be conceived and not perceived. Nor could an *infinite* quantity ever be perceived. What you perceive is not space, but the spatial. We must distinguish, as Kant fails to do, between our concrete spatial experiences and the general conception of space generalized from what is common to them. This has three dimensions and no qualitative differences. But these marks are only symbolic abridgments of the original spatial perceptions from which, by the help of thought and language, they have been abstracted. The three dimensions are mere means of geometrical investigation, indicating simply the number of elements required for determining the position of a point in space. Logically they have nothing to recommend them before any other directions whatever, though psychologically they are suggested by the up and down, right and left, front and behind, with which we mark off directions from our own bodies. But in the actual spatial perceptions, from which for ordinary geometrical purposes this conception of three axes at right angles to one another has been elaborated, there is an indefinite number of directions, each in itself as significant and important as any of the three axes. Nay, it is on that account possible to construct a geometry which shall operate with more than three dimensions or with fewer (provided in this case angles take the place of axes). In the second place, it is to be noted that these divers spatial directions have in the actual perceptions qualitative differences. For men, though perhaps not for birds, one hundred yards 'up' is a very different thing from one hundred yards 'along.' And even on the ground a mile is not the same to a poor walker as to a good one. There are qualitative differences in our original spatial experiences. By abstraction and summation, however, we construct from these definite qualitatively and quantitatively heterogeneous spaces the notion of an indefinite homogeneous space with three dimensions only. This abstraction, in the interests of geometry, necessarily appealed strongly to the philosopher of pure reason with his predilection for mathematics. Upon it he built the real world, making the notion of space the ground of the possibility of spatial things. This he did by endowing "airy nothing with a local habitation and a name," the name of 'perception *a priori.*'

In Kant's "metaphysical exposition" of space, then, we shall have to deny what he asserts and assert what he denies. Space *is not* a necessary perception *a priori.* Space *is* an empirical notion. That space was not a notion but a perception, Kant also argued from the existence of mathematics. If it were a notion, whether pure or empirical, he deemed mathematics incapable of explanation. This part of his argument is, however, in the second edition of the *Critique*[1] relegated to what is called the "transcendental exposition." And in that connection the great question of the possibility of geometry will in a short time be considered. For the present, it seems desirable to insist that, whatever be the explanation of geometry, space is an empirical notion.

But empiricism must not be identified with that particular account of knowledge which finds its sole data in sensations of different qualities and intensities. "For," as Mr. Ward has well said, "the longer we reflect the more clearly we see that no combination or association of sensations varying only in intensity and quality, not even if motor presentations are added, will account for the space-element in our perceptions."[2] As Locke said, the mind can frame unto itself no new simple idea. Though association, when manipulated by deft psychologists, may do wonders, it seems incapable of turning out a grist without corn to grind. And from series of sensations with no other characteristics than quality and intensity, the attempt to generate space has resulted only in the production of time, as Professor Bain and Mr. Herbert Spencer have conspicuously illustrated. Under the enchantment of this "mental chemistry" John Stuart Mill was hardy enough to assert, with commendable and characteristic candor, that "the idea of space is at bottom, one of time." [1] This *reductio ad absurdum* has not, however, prevented the ablest of German psychologists, Volkmann and Wundt, from giving a similar derivation of space. "The process of space-perception," says Wundt, "may be briefly described as a measuring of the manifold local sign-system of the retina [qualitatively different sensations] by the simple local sign-system of the movements. In its psychological nature this is a process of associative synthesis: it consists in the fusion of both groups of sensations into a product whose elementary components are no longer separable from one another in our immediate idea . . . Consciousness apprehends only their resulting product, the perception of space." [2] This "psychic synthesis," Wundt goes on to say, is like "chemical synthesis," by which, of course it was first suggested to English psychologists.

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[1] Not, however, in the first edition, with which compare also *Reflexionen*, Nos. 334 and 355 (II, 104, 110).

[2] *Encyclopædia Britannica*, Art. "Psychology" (Vol. XX, p. 53).

When now it is maintained that space is an empirical notion, it is not necessarily implied that the perceptional experience from which it is abstracted is itself a psycho-chemical product of non-spatial sensations. Indeed, if that were involved, one might rather suspect that the arguments by which space was proved to be a notion were illusory, and Kant, somehow, right after all. But between the mythological psychology of Kant and the chemical psychology of his successors, there is a middle way. They both, as Professor James has admirably shown, make space "a super-sensational mental product;"[3] the one, a product generated in the mind *by* non-spatial sensations, the other, a product *of* the mind itself for the envelopment of non-spatial sensations. But what if sensations themselves were not originally destitute of spatial investiture? Rival schools might at least rest from their labor of weaving philosophical cobwebs! Space perceptions would be 'given' like colors or sounds, and the notion of space derived from them by abstraction. The extractive art of mental alchemists would be no longer in demand. In Kant's language, we should no longer witness the ridiculous spectacle of one milking the he-goat and another holding the sieve.

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[1] *Examination of Hamilton*, 3d ed., p. 283.

[2] *Logik*, 1st ed.; I, pp. 458–9.

[3] *Mind*, No. 48, p. 540; the last article of a remarkable series on "The Perception of Space." These articles are reprinted with important revisions in the author's *Principles of Psychology*, II, Ch. xx.

Now it is very natural to suppose that we perceive space, as we perceive color, only because it is an original element of certain sensations, a part of the 'matter' of phenomena, in Kantian phraseology. This natural explanation was put out of sight by the subjectivistic wave of post-Lockian philosophy. The only school that might have brought it forward was that of Reid; but here the absolute opposition of primary and secondary qualities prevented the question itself from coming into notice. And Kant's dominance in later philosophy would have entailed upon such an hypothesis the damning epithet 'uncritical.' That space is sense-given, however, is to some extent implied in the metaphysics of Lotze, though Lotze lays greater stress on the reconstructive and interpretative activity of the soul, which surely cannot be wanting in the case of sensations in general. Mr. Ward, however, maintains explicitly this view of the original extensiveness of certain sense-impressions as the germ of space. "The first condition of spatial experience," he says, "seems to lie in . . . the extensity of sensation (what Dr. Bain has called massiveness). This much we may allow is original. . . . . Before and apart from movement altogether, we experience that massiveness or extensity of impressions in which movements enable us to find positions and also to measure."[1] And Professor James, after a masterly analysis of the physiological and psychological facts, reaches a theory of the perception and conception of space, which, however it may otherwise differ from Mr. Ward's, agrees in the initial and fundamental position that the "spatial quality" is "a *first* psychical thing," "that it enters with the first optical sensations." From this original sense-element Professor James develops the conception of space as follows: "All our sensations are positively and inexplicably extensive wholes. The sensations contributing to sense-*perception* seem exclusively to be the surface of the skin, retina, and joints ('muscular' feelings play no appreciable part). The total bigness of a cutaneous or retinal feeling soon becomes subdivided by discriminative attention. *Movements* assist this discrimination. The *education* of our space-perception consists largely of two processes—reducing the various sense-feelings to a common *measure*, and *adding them together* into the single all-including space of the real world. Both the measuring and the adding are performed by the aid of *things*. The imagined aggregate of positions occupied by all the actual or possible, moving or stationary, things which we know, is our notion of 'real' space—a very incomplete and vague notion in most minds."[1]

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[1] *Encyc. Brit.*, Art. "Psychology" (Vol. XX, pp. 46, 53).

Kant's arguments to prove that space is an *a priori* perception have been found untenable. Our analysis showed that space must be a conception empirically derived. And the experience of extensity from which it can be derived has now been distinguished from that experience of quality and intensity in which for the most part it has hitherto been sought, though in vain. With the collapse of the theory of space as an *a priori* perception or form of perceiving (and the two go together according to Kant) fall also, as in the case of time, the subjectivistic and phenomenalistic deductions by which Kant would separate knowledge from reality. It was because he supposed space and time subjective in a different sense from colors, that is, without dependence for their existence on real things, that they could have become for him forms constituting the essence of objects, which objects, therefore, could never be more than appearances in our modes of perception. With the abandonment of these mythological forms, space will occupy the same relation to outside reality as color does. If you say that the sensation of red has for its real counterpart some property of vermilion, which, of course, cannot be like the sensation, precisely the same can be said, as on Kant's theory it could not, of every perception of space. And Wundt makes the very probable supposition that the objective counterpart of the notion of space is "the regular order of a manifold which consists of individual real objects independently given."[2] At any rate, it is of some such objective reality that space is the subjective reproduction. It is not an *a priori* retort which distorts its *a posteriori* content, and makes illusion of reality. It is the mode in which a certain aspect of reality reveals itself to consciousness, and to that extent therefore is real knowledge. But the agnostic results of Kant's doctrine of *a priori* forms have already been considered in connection with time.

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[1] See the whole summary, with historical remarks, in *Mind*, No. 48, pp. 536–548.

[2] *Logik*, 1st ed., I, p. 463.

With mathematics, however, and more particularly with geometry, we have still to settle. It is the ultimate aim of the *Æsthetic* to explain the possibility of this science. But the fact of the existence of geometry as a body of irrefragable truth was so constantly present to Kant's mind that to him at least it stood as a proof of that *a priori* perceptive character of space which he ostensibly deduced from other grounds, and then used to explain the possibility of geometry. In the first edition of the *Critique*, it has its place among those arguments which, in the second edition, were massed together as the "metaphysical exposition." And in the *Reflections* it figures both in the positive and negative theses regarding space. "Space," it is said, "is not an empirical notion (1) because it makes experience possible, (2) because it is no object of the senses, (3) because geometrical principles have not the contingency and particularity of judgments based on experience."[1] And again, affirmatively, "space is a perception, and no notion *a priori*, ... for whence otherwise should synthetic judgments *a priori* be derived?"[2] Even in the second edition of the *Critique*, the argument of the new section, entitled "transcendental exposition of the idea of space,"[3] is to the effect that space must be an *a priori* perception or form of the faculty of perceiving, because only on that supposition is the possibility of the science of geometry to be explained.

Kant professes to be explaining the possibility of mathematics. He does so by the doctrine of space as an *a priori* perception. But his proofs of this doctrine we have found invalid. Nothing now remains but the assertion that space must be an *a priori* perception in order to account for geometry. But we are not bound to account for geometry at all, as its existence is not impugned. And if we should undertake the problem, may there not be other possible solutions? At all events a thesis is not to be accepted merely because it leads to right consequences, for, as is well known, a true conclusion may be deduced logically from false premises. If space as an *a priori* perception accounts for geometry, Kant will have to show that *nothing else* can account for it before asking us to believe that space *is* an *a priori* perception. Of course, if space as an *a priori* perception does not account for geometry, the dogma that it is an *a priori* perception remains without a shred of evidence. Two questions, therefore, must be considered. First, Is the possibility of the science of geometry explained by the doctrine that space is an *a priori* perception? Secondly, Can it be otherwise explained?

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[1] II, 104 (no. 334).

[2] II, 110 (no. 355).

[3] III, 60–61 (S. 143–4).

Let us begin with the first of these questions. Whoever compares Kant's various utterances on the subject of geometry (for that is the only branch of mathematics he considered with any thoroughness) will find that an explanation of the possibility of the science resolved itself for him into an explanation of what he considered its three essential characteristics, namely, the synthetic character of geometrical propositions, their universality and necessity, and their objective validity. Are these characteristic features of the science accounted for by the hypothesis that space is an *a priori* form of perception?

It has generally been conceded that Kant's theory explains at least the peculiar certitude of geometrical truth, though empiricists have taken care to add it is equally explicable on other grounds. But it may very well be questioned if the concession is not the result of the survival of rationalistic modes of thought even when they are least suspected. In the eighteenth century the validity of a judgment seemed greatly enhanced by the derivation of its materials from the innate resources of the mind. This mental origin conferred a met-empirical authority. Hence the great struggle between rationalists and sensationalists turned upon the legitimacy or illegitimacy of the genealogical claim of certain propositions. But we have come to see that no kind of origin as such can make a proposition true. Why then should the *a priori* origin of space make the truths of geometry universal and necessary? No doubt if space be a form with which I invest every external object I perceive, it is a tautology to say that *all* my external objects *must* be spatial. But more than that Kant's doctrine does not warrant, though this assuredly is not the universality and necessity to be explained. It is asserted that every geometrical proposition affirming a determination of space is universal and necessary, *because* space is an *a priori* form of perception. But I cannot see the force of that 'because.' If space is an *a priori* form of external perception in the Kantian sense, I can see that all external objects must be in space, but I am absolutely in the dark about the particular relations of parts of space to one another. When I discover these relations, if I call them universal and necessary, it must be on other grounds than the absolutely irrelevant and, as it were, opaque consideration that the space in which I have found them is an *a priori* form of perception. The certitude, relative or absolute, of a proposition depends upon the force, relative or absolute, of its proof or evidence. Whether the subject of proof be space or color, whether it be *a priori* or *a posteriori*, does not in the least affect the conclusion.

The claim that Kant's doctrine explains the synthesis in geometrical propositions deserves more serious consideration. For since Kant's time at least it can no longer be held they are analytic. And if synthetic, it must be admitted that the synthesis is based on perception, as Kant also maintained. But this is not to embrace the doctrine of *a priori* perception; for there is also empirical perception, nay before Kant's time no other was heard of, and no other, I believe, is even to-day intelligible. The case, however, must not be prejudged. Does the hypothesis of *a priori* perception explain the synthesis implied in every geometrical proposition? It seems to do so in the hands of Kant. Synthesis is dependent upon perception; empirical synthesis (*e. g.*, 'the stove is hot') upon *a posteriori* perception (*i. e.*, feeling the stove); why not also pure synthesis (as in geometrical propositions) upon *a priori* perception (*i. e.*, space)? But this very statement with its exemplifications shows the difficulty. When I say empirical synthesis depends upon perception, I mean upon seeing, touching, tasting, or some other perceptive mode. What is meant by *a priori* perception? A perception independent of sense-experience, of seeing, touching, tasting, etc. But what can I thus perceive? One would naturally suppose, space. But such is not Kant's teaching. Space, which he calls an *a priori* perception, is, as we have seen, not itself perceived, and is finally declared a mere formal or subjective condition of perceiving. It cannot then be the ground of synthesis. *A priori* perception is not touching, seeing, or any other mode of perceiving. It is an empty phrase only, the ghost of that perception we require for geometrical synthesis, but eviscerated of everything that could give it.

The remaining characteristic of geometry, its objective validity, seems to have profoundly exercised the mind of Kant. And naturally. For as he had given up the rationalistic belief that all knowledge originated in the mind alone, and yet made a reservation in favor of mathematics, it was surely an interesting consideration why this part of mind-originated knowledge had validity for the objective world. But for any one but an apostate from rationalism there is no problem to be solved. For the empiricist finds no difference in kind between mathematical and other knowledge, all of which he explains by perception. For him, as for the thorough rationalist, mathematics has the same claim to objective validity as the truths of chemistry or botany. But Kant maintained that, apart from his theory, "the space of the geometer would be considered a mere fiction, and no objective validity ascribed to it, because we cannot see how things must of necessity agree with an image of them, which we make spontaneously and previous to our perception of them."[1] This assumes that the geometer operates with mind-made figures in a mind-made space. Kant, therefore, erects for himself the problem of objective validity. That assumption being made, it must also be added he has solved the difficulty. His solution, however, is rather an escape from the problem than an answer to it. It is this: The propositions of the geometer agree with objects, because objects so far as those propositions concern them (that is, spatially) are made by us out of the very stuff whose inner constitution and relations are formulated by geometry. Kant's self-made problem of the objective validity of geometry is resolved by making the objective world an appearance of ours—an *Erscheinung* which nothing can save from becoming mere *Schein.*

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[1] *Prolegomena*, § 13, Remark 1 [IV, 36 (51, 52)].

It will now be acknowledged that in regard to mathematics, Kant's theory is not of such high merit as has been generally supposed. It remains only to inquire whether geometry, which the *a priori* doctrine of space fails to account for, can be explained on any other grounds. It will be found that all its characteristics are due to its derivation from experience and the peculiarity of its subject matter.

As to the universality and necessity of geometrical propositions, it may well be doubted whether these marks are more than phrases which, like rudimentary organs, have survived from rationalism and are now without a meaning. If it be otherwise, and if that peculiar certitude which undoubtedly belongs to mathematical truths can be justly described as universality and necessity, we can find its grounds, objectively, in the simplicity of space as a mere homogeneous manifold, and, subjectively, in repetitions of the invariable experience of their validity. In the case of the axioms, the simplicity is obvious. But even in complex demonstrations, we are always dealing with the one simple conception of space, and everything is brought to the test of perception by means of construction. And construction, as Hobbes pointed out long before Kant, is what brings geometrical figures under our control, and enables us to know them through and through, as we cannot know physical objects which are given to us from without, and not made in accordance with notions of ours. We do not create space, as Kant supposed, but, as Kant also saw, we do construct figures in space. And in the constructibility of spatial figures, the generality of the notion of space from which everything but tri-dimensional extension has been abstracted, and in the psychological effects of invariable experience, we have the conditions for the production of the apodictic certainty of geometrical truth. It is not intended by the mention of customary experiences to detract from the real certainty of mathematical propositions. But custom, it cannot be doubted, adds to their convincing force. The objective grounds of their apodicity are, it must be remembered, not independent of experience. Still, as the lines we draw are conditioned by our geometrical conceptions of space, and this is not only simple and transparent in itself, but attested by an invariable objective experience, there seems little ground for the doubt that future astronomical observations may show that the sum of the three angles of a triangle are not equal to two right angles, though that suggestion was made by an eminent mathematician many years ago and has frequently been re-echoed since.[1] Kant himself has admirably described the grounds of the certainty, and especially the universality, of geometry. "The particular figure," he says, "drawn on the paper is empirical, but serves nevertheless to express the concept of the triangle without any detriment to its generality, because, in that empirical perception, we consider always the act of the construction of the concept only, to which many determinations, as for instance, the magnitude of the sides and the angles, are quite indifferent, these differences which do not change the concept of a triangle being entirely ignored."[2]

That the synthesis in geometrical proportions rests upon perception was properly emphasized by Kant, and has since been confirmed by Riemann's transcendent geometry of a space or manifold of n dimensions. But nothing except Kant's belief in the met-empirical authority, and therefore, *a priori* origin, of mathematics requires us to hold that this perception is not our everyday seeing, or (as in the case of the blind) touching. Geometry rests ultimately upon superposition of figures, and their coincidence is simply a matter of observation, or of customary belief founded upon observation. And, in spite of his too frequent obscuration of the whole subject by the appeals to *a priori* perception, Kant has more than one description of the geometrical process which seeks synthesis in no higher source than ordinary perception. He gives, for example, to the geometer, the problem of finding the relation of the sum of the angles of a triangle to a right angle. And he makes him proceed by constructions, as in Euclid, till he "*sees* that an exterior adjacent angle has been formed, which is equal to an interior, etc." Then Kant sums up the process of the geometer most truly, as follows: "In this way he arrives, through a chain of conclusions, *though always guided by perception*, at a thoroughly convincing and general solution of the question."[1] This empirical source of geometrical synthesis is in the *Reflexionen* still more clearly exhibited by the aid of a comparison, with which we may close. "The synthetical propositions of space are not contained in the general notion of space any more than the experimental propositions the chemist makes about gold are contained in its general notion, *but they are drawn from, or found in, the perception of space*."[2] The geometer is no more an *a priori* percipient than the chemist: both depend upon actual everyday perception.

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[1] Lobatschewsky, Crelle's *Journal für reine und angewandte Mathematik*, Bd. xvii, 1837, p. 302. Quoted in Wundt's *Logik*, I, 445.

[2] III, 478 (611).

The empirical theory of mathematics is not perplexed with the problem of objective validity, as has been already observed.

The total result is that the *a priori* doctrine of space fails to account for geometry, which, on the other hand, can be satisfactorily explained as the most general of the empirical sciences. Kant has not solved his problem, How is pure mathematics possible? Space has not been proved, either on mathematical or on other grounds, an *a priori* perception or form of perception. A similar conclusion has already been reached with regard to time.

Space and time are the only elements of the *Transcendental Æsthetic*. Kant tells us in the *Reflexionen*,[3] he was originally disposed to add motion, but finally excluded it because it contained more than the pure forms of sense. Our criticism ends with the same conclusion regarding space and time themselves. There are no pure forms of sense. The very idea belongs to a mythological psychology now all but obsolete. If in the perception of objects we are not, as is generally supposed, informing ourselves of reality, Kant has not demonstrated that we are informing reality with ourselves and transforming it into appearance. The phenomenalism, however, which Kant bases on the doctrine of the *Æsthetic* he completes in the *Analytic*, and thither we must at some future time follow it, even though, as has been shown, its foundations are of sand.

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[1] III, 479–480 (614).

[2] II, 110 (No. 354).

[3] II, 101 (No. 326).

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